Computed Tomography and Thermography Increases CMC Material and Process Development Efficiency and Testing Effectiveness.

Michael Effinger, Ron Beshears, David Hufnagle, James Walker, and Sam Russell,
NASA Marshall Space Flight Center, Huntsville, AL
Bob Stowell and David Myers, Lockheed Martin Corporation, Huntsville, AL

Nondestructive characterization techniques have been used to steer development and testing of CMCs. Computed tomography is used to determine the volumetric integrity of the CMC plates and components. Thermography is used to determine the near surface integrity of the CMC plates and components. For process and material development, information such as density uniformity, part delamination, and dimensional tolerance conformity is generated. The information from the thermography and computed tomography is correlated and then specimen cutting maps are superimposed on the thermography images. This enables for tighter data and potential explanation of off nominal test data. Examples of nondestructive characterization utilization to make decisions in process and material development and testing are presented.